ANALYSIS OF FOOD ACCESSORIES UNDER THE FOOD-AND-DRUGS LAW.

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AMONG the most important of the food accessories that we have to deal with in the drug laboratory are the aromatics, or spices, which furnish not an unimportant part of our daily food. The definitions and analytical data fixed for the various spices were referred to in a former paper given to this Academy. Circular No. 19 of the U. S. Department of Agriculture contains the standard for these important substances; but it is clear from our observations that certain revisions will be necessary from time to time. We have noticed in our own laboratory work, for example, that there is a great variation existing between the minimum and the maximum quantities of important constituents of these spices, and the spices under consideration were in every case genuine. This experience has been duplicated by others who are working in the same line.

Federal standards are very fair and liberal, and it would seem that these standards should be observed. Yet there are occasionally those who will transgress the limits fixed in the federal standards, and yet are genuine. We may cite, for example, the percentage content of quercitannic acid and the ash content. These not infrequently fall below the minimum requirements of the federal standard, but it is fair to assume that the analyst, when he finds by microscopical analysis that the sample is a pure spice, will not of course refuse to pass it if it should analyze below the minimum requirements in these particulars.

The essential constituent, of course, of a spice is the volatile oil. In the majority of cases this is determined by the volatile extract and the nonvolatile extract. It is rather surprising how variable this constituent is, as, for example, will be seen from a report of allspice, or pimento. We shall quote from the analyses of a number of samples which are published by R. O. Brooks, formerly state chemist of Pennsylvania and New Jersey. The approximate analysis, showing the variations in composition as reported in twenty-five analyses of pure allspice, are as follows:

	Minimum.	Maximum.
Moisture	5 51%	10.14%
Ash (mineral matter)	4 01	7.51
Ash insoluble in acid	0 00	0 95
Volatile ether extract (oil)	1 29	5.21

	Minimum.	Maximum.
Nonvolatile ether extract	1.60%	7.72%
Starch by diastase method	1 82	3.76
"Starch" by acid inversion	16.56	20 65
Crude fiber	13 45	23 98
Protein (nitrogen × 6.25)	4.03	6.37
Quercitannic acid	4.32	12.48

What is said of allspice is also true of cloves, pepper and other spices. As regards cinnamon bark, we have found a considerable amount of adulteration of cinnamon in carton packages. A number of cinnamon-like barks of unknown species and of little value are coming into the market in quills and in more or less flat pieces. They contain little or no oil, and commercial powdered cinnamon of all kinds has rarely if ever been strictly pure. In 1894 the Department of Chemistry, U. S. Department of Agriculture, bulletin 13, page 2, published the statement that "not a particle of ground cinnamon (referring to Ceylon cinnamon) can be found upon the market." It is well known, however, that powdered cinnamon is made from cassia cinnamon and cassia chips. And it is interesting to state here that Mr. Brooks's analyses of twenty-six samples of cassia were of the following percentage in composition:

	Minimum.	Maximum.
Moisture	6 53%	17.45%
Volatile ether extract	0.55	5.15
Nonvolatile ether extract	0.74	4.13
Crude fiber	14.33	28.80
Starch (by acid method)	16.65	32.04
"Protein" (N. × 6.25)	2.63	5.44
Total ash (mineral matter)	2.35	6.20
Ash insoluble in acid ("sand")	0.02	2.42

In regard to black pepper, it has been the common practice of former days to grind with the pepper grains, and mix with the pepper, an undue amount of hulls. We examined recently a package of pepper labeled "Compound Pepper." Why the term "compound" was applied to this spice is difficult to imagine. But on examining the sample microscopically it was found that at least 25 per cent more of the hulls of the pepper were present than ordinary pepper pulverized would furnish. It has been necessary, therefore, for the board to make a ruling that a spice, or compound spice, shall include the whole spice, representing the various constituents in the proportions in which they exist in the fruit itself in the dried condition. This will in the future eliminate such methods of adulteration. Pepper itself should contain no less than 6 per cent of nonvolatile extract, not more than 7 per cent of total ash, and not more than 15 per cent of crude fiber. It is evident that such a spice as I have indicated above would not come within the limits of such a standard. Pepper hulls will contain only

about from 0.68 to 1.11 per cent of volatile ether extract, while the minimum for a good sample of pepper should be at least 0.9 per cent. As to crude fiber, there is an immense difference between pepper hulls and true pepper. Pepper hulls yield from 21 to 32 per cent of crude fiber, while a Singapore pepper will yield but from 3.5 to 6.2 per cent. The ash constituent of pepper hulls will be from about 8 per cent to 18 per cent, and in exceptional cases much more, while pure pepper will yield from about 1 per cent (or in exceptional cases less) to 1.8 per cent.

For a rapid determination of the quality of a spice, I would report what was said in a former paper: "That a standard alcoholic solution, diluted to a definite volume in water, sweetened or otherwise, serves very well for the purpose of comparison, and for quickly eliminating worthless material."

Laboratory No. 3483. GROUND CLOVES.—"Jupiter Brand."

Ash	13.20%
Total ether extract	8.31
Nonvolatile ether extract	7.58
Volatile extract	.73
Soluble ash	11.89
Insoluble ash	1.31
Color of ash	Red.

Soluble ash composed partly of iron and alumina, showing flagrant adulteration.

Laboratory No. 3484. GROUND ALLSPICE.

Ash	5.59%
Total ether extract	5.53
Nonvolatile ether extract	4.87
Volatile ether extract	.65

Laboratory No. 3482. GROUND PEPPER.

Ash	5.98%
Total ether extract	8.26
Nonvolatile ether extract	7.80
Volatile ether extract	.46

Laboratory No. 3531. PURE POWDERED CINNAMON.

Ash	4.17%
Total ether extract	4.45
Nonvolatile ether extract	2.97
Volatile ether extract	1.48

Laboratory No. 3533. PURE POWDERED MUSTARD.

Ash	5.10%
Total ether extract	19.55
Nonvolatile ether extract	19.47
Volatile ether extract	.08

Laboratory No. 3599. PURE POWDERED BLACK PEPPER.

Ash	6.38%
Total ether extract	8.84
Nonvolatile ether extract	8.34
Volatile ether extract	.50